ESTIMATE OF POSSIBILITIES OF CARRIER-FREQUENCY TELEPHONY IN THE GERMAN DEMOCRATIC REPUBLIC,

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The large-scale dismantling of telecommunications installations after the end of the war has resulted in difficulties which increase as the ~~xxxx~~ economy revives and as administrative centralization increases. In a government-controlled economy, however, properly functioning communications is an absolute essential. While the shortage of telephone sets has been pretty much eliminated by new production, the chief bottleneck still persists in telephone exchanges and long-distance lines. The disastrous shortage of long-distance connections in the Eastern Sector of Berlin is due to the dismantling of the local exchanges while the difficulties in long-distance telephony are caused by the dismantling of the long-distance cables and the overloading of the lines which have remained. There are only two possible remedies:

A) Laying new modern long-distance lines; B) Better utilization of existing cables.

To A)

The development work has ~~xxx xxxx~~ already been completed (mainly at SAG Kabel). Two types of cables have been found acceptable for use:

1) 32-pair cable for carrier frequency and broadcast operation:

Core: Two strands, shielded for use as service circuit, copper wire of 0.9 mm diam.

Inner layer: 3 pairs, individually shielded, for broadcast purposes, copper wire of 1.4 mm diameter

2 quads, copper wire of 1.2 mm diameter, for low-frequency telephony

Outer layer: 12 quads, copper wire of 1.2 mm diam., for carrier-frequency telephony

2) 24-pair cable for carrier-frequency telephony only:

Inner layer: 3 quads

Outer layer: 9 quads — each strand of copper wire of 1.2 mm diameter.

As the capacity of the cable works is limited and as the plants also have large reparations and export orders to fill, it is not expected that these cables will be

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available in the Soviet Zone in large quantities in the near future.

To B)

This method is the only way out of the pressing difficulties. There is hope of multiplying the utilization of the lines by means of carrier frequency.

The quad lines used in the German long-distance cables of older construction are highly susceptible to crosstalk interference at high carrier frequencies. A large number of investigations during operation in practice has shown that in general, only 4 quads of a 98-pair long-distance cable can be used for carrier-frequency purposes, and only after they have been transposed [entspult].

The damping conditions in mNeper/ kilometer, however, are so bad even for transposed standard cables, that only the strands with copper wire of 1.4 mm diameter can be used for carrier frequency operation. The strands with 0.9 mm copper wire are unsuitable. The normal distance between repeater stations of 75 km cannot be lengthened; just the contrary, it will be necessary to have an intermediate repeater station added to every 75-km section, cutting down each repeater section to 37.5 km. The intermediate repeater stations have their own current supply, but need no other maintenance. An arrangement of this kind would permit operations in a frequency range ~~of~~ up to 70 kc.

The method with the 8-channel system with frequency gap ~~xx~~ (type ME 8) which has been in use for some time can be considered obsolete. The most economical utilization of the lines would ~~be~~ permit use of the 12-channel system without frequency gap. However, in this case, the practical limit for a repeater section would be 37.5 km. Further investigations have shown that still another intermediate repeater station would have to be placed into the 37.5-km section, thus making the repeater section about 18.8 km long. For practical reasons, it will be necessary to provide outside current supply for the intermediate repeater stations located between those with their own current supply.

The cable of the future is the 32-pai cable described in A)1). With a 60-channel system, it will provide 24 • 60 = 1,440 additional signals, ~~xxxx~~ but the repeater sections will be only 18.8 km long. If a certain line operates under a lower load, the same cable can also

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be used for a 12-channel system with a carrier frequency band of up to 60 kc. In this case, the old repeater section of 75 km length will be sufficient.

Fig. 1:Damping in mNep/km = (f) cps , for 98-strand LF cable with 1.4 mm diam. copper cable as used in the GDR

Normaler Vierer = normal quad
Entspulter Vierer = transposed quad

Fig.2: Frequency ranges of different channel systems

a) 2x 4 channels with gap, repeater section 37.5 km, damping in neper/ section : 6.2 in transposed cable of old type, 5.9 in carrier-frequency cable

b) 12-channel system in normal transposed cable; other details same as a)

c) 24-channel system ~~with~~ without gap; repeater section 18.8 km, damping 4.3 in old transposed cable, 4.0 in new carrier-frequency cable

d) 24-channel system without gap; repeater section 18.8 km, damping 4.6 in old transposed cable, 4.3 in modern carrier-frequency cable

e) 48-channel system with gaps; repeater section 18.8 km, damping 6.3 in modern carrier-frequency cable

f) 60-channel system; other details same as e)

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